

## CBSE NCERT Solutions for Class 11 Biology Chapter 19

### *Back of Chapter Questions*

#### 1. Define Glomerular Filtration Rate (GFR)

##### **Solution:**

- Glomerular Filtration rate is referred to as the amount of the filtrate produced by the kidneys per minute.

-GFR in a healthy individual is **125 ml per min**, that is **180 liters** per day.

#### 2. Explain the autoregulatory mechanism of GFR

##### **Solution:**

The kidney autoregulates the glomerular filtration rate by the means of **Juxta glomerular apparatus**.

-Juxta glomerular apparatus is a special sensitive region formed by cellular modifications caused due to close association of distal convoluted tubule and the afferent arteriole.

-When the GFR decreases, the cells of JGA releases renin due to which the renin angiotensin system is activated.

-When this system is activated, vasoconstriction of blood vessel occurs, increasing the glomerular filtration rate, and bringing it back to the normal.

#### 3. Indicate whether the following statements are true or false :

(a) Micturition is carried out by a reflex.

- (b) ADH helps in water elimination, making the urine hypotonic.
- (c) Protein-free fluid is filtered from blood plasma into the Bowman's capsule.
- (d) Henle's loop plays an important role in concentrating the urine.
- (e) Glucose is actively reabsorbed in the proximal convoluted tubule.

**Solution:**

(a) Micturition is carried out by a reflex.

True

Micturition refers to the process of emptying the urine from the urinary bladder. When the urinary bladder is filled the stretch in the muscle is detected by the osmoreceptor receptors. The signal from these receptors goes to CNS of brain CNS sends the motor signal due to which opening of first involuntary sphincter takes place followed by the opening of the voluntary sphincter and carrying out the discharge of urine from the body.

(b) ADH helps in water elimination, making the urine hypotonic.

False

When there is excessive elimination of body fluid, then the anti-diuretic hormone is released from the neurohypophysis region of the pituitary. The ADH hormone prevents diuresis by reabsorbing the water from the tubules. It constricts the blood vessel hence preventing the water loss in the urine.

(c) The protein-free fluid is filtered from blood plasma into the Bowman's capsule.

- True

In the process of ultra-filtration, all the components of plasma get filtered, but protein is retained back in the blood.

(d) Henle's loop plays an important role in concentrating the urine.

True

Vasa recta and Henle's loop helps in concentrating the urine by counter-current mechanism.

(e) Glucose is actively reabsorbed in the proximal convoluted tubule.

True

Proximal convoluted tubule helps in the reabsorption of glucose by spending energy.

**4. Give a brief account of the counter current mechanism.**

**Solution:**

**The mechanism by which the exchange of fluid takes place, when the fluid flows in two adjacent tube, in the opposite direction, then it is referred to as the counter current mechanism.**

-The structures that participates in the counter current mechanism are **Henle's loop of nephron and blood vessel vasa recta.**

-The filtrate containing fluid flows in a downward direction in ascending Henle's loop, and it flows in an upward direction in the descending loop of Henle's.

-The blood flow in the ascending and descending region of vasa recta also takes place in the opposite direction.

-There is a close association between henle's loop and blood vessel vasa recta, and the flow of liquid occurs in the opposite direction. The counter current (flow in opposite direction) in these structures aids in increasing and maintain the osmolarity of inner medullary interstitium from **300 mOsmol/L inside the cortex to 1200 mOsmol/L.**

**Steps that occurs in the counter current mechanism:**

Salt and Urea is added to the ascending loop of henle by proximal convoluted tubule depending upon the osmolarity of the interstitial fluid the water leaves from descending loop of henle, and the NaCl is

The NaCl and urea then enter the descending loop of Henle which is the transported to descending limb of Vasa recta and NaCl are then returned to the interstitium fluid by Vasa recta.

**The arrangement of the loop of Henle's and vasa recta to carry out the transport of substances is the counter current mechanism.**

**Significance of Counter current mechanism:**

- It helps in maintaining the osmolarity and concentration gradient of the interstitium.
- The concentration gradient helps in the uptake of water in the proximal convoluted tubule, which increases the concentration of urine.
- The concentration of urine increases four times the filtrate that is formed in the initial stage.

**5. Describe the role of liver, lungs, and skin in excretion.**

**Solution:**

**Excretion by Lungs:** Elimination of a large amount of carbon di oxide (200ml per minute) and water takes place through lungs every day.

**Excretion by the liver:** Liver produces excretory waste in the form of bilirubin, biliverdin, cholesterol degraded steroid hormone vitamins and drug. They are excreted out from the body along with the faecal matter.

**Excretion by the skin:**

Major excretory products eliminated through the skin are sweat and sebum

**Sweat** is a watery fluid produced by sweat glands; it contains water, salt, lactic acid, and a small amount of urea. It is produced by sweat glands and is eliminated through the skin.

**Sebum** contains substances like sterols, hydrocarbons, and waxes it is produced by the sebaceous gland and is eliminated through the skin. Sebum also provides an oily protective coat over the skin which prevents it from dryness.

**6. Explain micturition.**

**Solution:**

- Micturition refers to the process of emptying the urine from the urinary bladder.
- When the urinary bladder gets completely filled the stretch in the muscle is detected by the osmoreceptor receptors. The sensory signal from these receptors goes to CNS of

the brain, CNS sends the motor signal due to which opening of first involuntary sphincter takes place followed by the opening of the voluntary sphincter and carrying out the discharge of urine from the body.

- A person can control the urge to urinate by controlling the muscles of voluntary sphincter.

**7. Match the items of column I with those of column II :**

**Column I    Column II**

- (a) Ammonotelism (i) Birds  
 (b) Bowman's capsule (ii) Water reabsorption  
 (c) Micturition (iii) Bony fish  
 (d) Uricotelism (iv) Urinary bladder  
 (d) ADH (v) Renal tubule

**Solution:**

Column I	Column II
a) Ammonotelism	(iii) Bony fish
b) Bowman's capsule	(v) Renal tubule
c) Micturition	(iv) Urinary bladder
d) Uricotelism	(i) Birds
e) ADH	(ii) Water reabsorption

**8. What is meant by the term osmoregulation?**

**Solution:**

Osmoregulation is the process of maintaining a fixed osmotic concentration inside the body fluids and cells by controlling the amount of salts and water.

**9. Terrestrial animals are generally either ureotelic or uricotelic, not ammonotelic, why?****Solution:**

Ammonia is a toxic chemical produced by the process of metabolism. It is converted into less harmful form "**urea**" in the liver and is then released into the blood. Urea is further filtered and excreted out from the body by the specialized organ kidney.

Organism which excretes ammonia as the waste product are **ammoniotelic**. Ammonia is readily soluble in the water and can be excreted out by the mechanism of diffusion through gills; hence, it forms the excretory product in **fishes aquatic animals and aquatic insects**. Kidneys are not required for the excretion of ammonia; also, the excretion of ammonia requires a lot of water.

In the terrestrial organism, for example, mammals, terrestrial amphibians and marine fishes are **ureotelic**, and organisms' reptiles, birds insects, snakes excrete uric acid pelleted as the nitrogenous waste and are known as **uricotelic**.

The reason due to which terrestrial animals are excreted out urea, or uric acid and not ammonia are as follows:

- \_ Urea is less toxic than ammonia.
- Kidney restores ammonia to maintain the osmolarity in the kidney matrix.
- Conversion of ammonia into urea or uric acid pellet prevents water loss from the body.

**10. What is the significance of juxta glomerular apparatus (JGA) in kidney function?****Solution:**

The JGA regulates the GFR by activating the **Renin- angiotensin system**.

JGA detects the drop in glomerular blood flow or glomerular blood pressure or GFR and gets activated to release **renin**.

Renin acts upon the angiotensin present in the blood and converts it into **angiotensin I** and then to **angiotensin II**.

**Angiotensin II** acts upon the blood vessels and constricts them, which increases the glomerular blood pressure and further rate of filtration by the glomerulus.

Second, it acts upon the adrenal cortex, causing the release of the hormone aldosterone. This hormone causes the reabsorption of sodium ions and water from the distal region of the tubules. Further increasing the blood pressure and glomerular filtration rate.

**Excess increase in blood flow** is detected by the **atria** causing the release of **Atrial Natriuretic Factor**. This **reduces** the amount of **renin** in the blood and causes vasodilation hence decreasing the blood pressure. This system keeps a **check** on renin angiotensin system.

**11. Name the following:**

- (a) A chordate animal having flame cells as excretory structures
- (b) Cortical portions projecting between the medullary pyramids in the human kidney
- (c) A loop of capillary running parallel to the Henle's loop.

**Solution:**

- a) Cephalochordate (Amphioxus)
- b) Columns of Bertini
- c) Vasa recta

**12. Fill in the gaps :**

(a) Ascending limb of Henle's loop is \_\_\_\_\_ to water, whereas the descending limb is \_\_\_\_\_ to it.

(b) Reabsorption of water from distal parts of the tubules is facilitated by hormone \_\_\_\_\_.

(c) Dialysis fluid contain all the constituents as in plasma except \_\_\_\_\_.

(d) A healthy adult human excretes (on an average) \_\_\_\_\_ gm of urea/day.

a) impermeable, permeable

-The ascending loop of Henle's does not allow the water to come in and is **impermeable** to water though it carries out the active and passive transport of electrolytes.

-The descending loop of Henle's is **permeable** to water and is impermeable to electrolytes.

(b) ADH or Vassopressin:

When there is excessive elimination of body fluid, then the anti-diuretic hormone is released from the neurohypophysis region of the pituitary. The ADH hormone prevent diuresis by reabsorbing the water from the distal parts of the tubules. It constricts the blood vessel hence preventing the water loss in the urine. Hence, making the urine hypertonic.

(c) nitrogenous waste

The dialysis fluid has the osmolarity similar to the plasma it does not contains **nitrogenous waste**. When it is passed through the body, the diffusion of nitrogenous wastes takes place from the blood, thereby clearing the blood.

(d) 25 to 30

On an average of 25 to 30 gm of urea is eliminated in 1-1.5 liters of per day.

